Geophysical Research Abstracts
Vol. 15, EGU2013-13779, 2013
EGU General Assembly 2013

On the parameterization of Injection Height and the use of the MISR plume height project data

Ronan Paugam (1), Martin Wooster (1), Jonathan Atherton (1), Johannes W. Kaiser (1,2,3), and Saulo Freitas (4)

(1) King's College London, UK, (2) European Centre for Medium-range Weather Forecasts, UK, (3) Max Planck Institute for Chemistry, Germany, (4) GMAI, CPTEC-INPE, Brazil

The parameterization of fire injection height in global chemistry transport model is currently a subject of debate in the atmospheric community. The approach usually proposed in the literature is based on relationships linking injection height and remote sensing products like the Fire Radiative Power (FRP) or the brightness temperature which can measure active fire properties. In this work we present an approach based on the plume rise model (PRM) originally developed by Saulo Freitas, so that effects of atmospheric stability and latent heat are also taken into account. The original plume rise model is modified: (i) the input data of convective heat flux and the Active Fire area are directly force from FRP data derived from a modified version of the Dozier algorithm applied to the MOD12 product, (ii) and the dynamical core of the plume model is modified with a new entrainment scheme inspired from latest results in shallow convection parameterization. An original aspect of this work is to present an optimization of the new version of the Freitas PRM based on (i) fire plume characteristics of single fire events extracted from the official MISR plume height project and (ii) atmospheric profile derived from the ECMWF analysis. The selection of the fire events out of the MISR data set represents the main task of this work. In particular, it is shown that the only information extracted from Terra overpass is not enough to guaranty that the injection height of the plume is linked to the FRP measured at the same time. The plume is a dynamical system, and a time delay (related to the atmospheric state) is necessary to adjust change in FRP to the plume behaviour. Therefore, here multiple overpasses of the same fire from Terra and Aqua are used to determine fire and plume behaviours and system in a steady state at the time of MISR (central scan of Terra) overpass are selected for the optimization procedure. Results show that in the case of some fire event, the PRM is able to predict the formation of a pyroconvective cloud where observation from Aqua overpass show massive change in plume behaviour.